REMARKS

The Examiner indicated that Claims 3, 5, 11, 12, 19 and 20 would be allowable if rewritten, and rejected the remaining claims as obvious over various combinations of six patents. The claims are amended to incorporate features from the allowable claims into the independent claims, and new claims containing those features, and other features, are also submitted. Reconsideration and allowance is respectfully requested.

Section 112 Rejections:

Claim 7-14 were rejected because "the mechanical resonator" in Claim 1, line 2, lacked antecedent basis. "The" has been changed to "a" in order to provide antecedent basis. This amendment does not narrow the claim. Reconsideration and withdrawal of the rejection is respectfully requested.

Allowable Claims 3, 5, 11, 12, 19 & 20

These dependent claims were indicated as allowable if rewritten. Features from allowable Claim 3 are placed in independent Claim 1. Allowable Claim 11 is rewritten as independent Claim 7. Allowable Claim 20 is rewritten as independent Claim 16. Allowable Claim 11 is rewritten as new Claim 22, but broadened so it does not define an elliptical path or a modulated signal. Allowance of these claims is thus respectfully requested

New Claims 21-41

New independent Claims 21, 25, 26 and 27 contain features from allowable Claim 11 which defined a second motion of the selected contacting portion.

New independent Claims 22, 25 and 36 , and dependent Claim 29 seek broader protection on a driver apparatus using features found in prior claim 6, namely that the same electrical conductor used to form the coil also connects, or bridges the space between, the vibrating element and the control element.

New independent Claims 27 and 36 define sending first and/or second signals to the piezoelectric element or vibrating element through a single wire.

New dependent Claims 23, 30 and 38 define forming the resonator to have the same cross-sectional shape in a set of parallel planes that are effectively parallel to the longitudinal axis. This common cross-sectional shape is illustrated in a number of figures, including Figure

52-54, and 56-58. New dependent Claims 24, 31 and 39 have similar cross-sectional limitations, but for a shorter length of the resonator between the selected contacting portion and the sidewalls forming the opening into which the piezoelectric element is placed. This construction is shown in part, in Figure 67 which has a curved contacting portion but a constant cross-sectional shape in the plane of the paper along the designated length.

New dependent Claims 33-35 and 41 define the piezoelectric elements as being cofired. Antecedent basis is found in part in Provisional Application No. 60/236,005, at pages 51-52, which was incorporated by reference and which shows a multilayered piezoelectric element that one skilled in the art would recognize is obtainable only by cofiring.

Attorney of Record

The undersigned is the attorney of record to which correspondence is to be mailed, pursuant to an assignment from Siemens to Elliptec, and power of attorney by assignee Elliptec, copies of which were mailed in this application on August 9, 2001. If the Examiner's records indicate otherwise, please contact the undersigned so we can straighten it out.

Conclusion

The claims are believed to be in a condition for allowance and such allowance is respectfully requested. If the Examiner has any questions, please contact the undersigned in order to resolve any matters over the phone and to pass the application to issuance.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version with markings to show changes made".

If any additional fee is required, please charge Deposit Account Number 19-4330.

Respectfully submitted,

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Version With Markings to Show Changes Made

Please amend the claims as follows:

1. (Once Amended) A piezoelectric driver apparatus for controlling the operation of a vibrating element having a mechanical resonator, apparatus comprising:

a vibrating element having an inherent capacitance;

at least one switching element allowing the application of a predetermined signal;

at least one electrical resonator driver circuit driving the vibrating element, wherein the driver circuit is electrically coupled to and activated by the switching element;

at least one inductive coil electrically coupled to the vibrating element to form an electric resonator together with the capacitance of the vibrating element so the signal excites the driver circuit at a predetermined frequency, the coil being either mounted to the vibratory element or mounted to a common support with the vibratory element, wherein the vibrating element is a piezoelectric element driving a mechanical resonator and the coil encircles a portion of the piezoelectric element.

Please delete Claim 2.

3. (Once Amended) The apparatus of Claim 1, wherein the vibrating element is a piezoelectric element driving a resonator and the coil encircles **[a portion of the piezoelectric element or]** the mechanical resonator.

4. The apparatus of Claim 1, wherein the vibrating element comprises a piezoelectric element driving the mechanical resonator, the resonator having a selected contacting portion, the piezoelectric element driving the resonator at a first frequency provided by the driver circuit to cause the resonator to vibrate in two modes that cause the selected contacting portion to move in a first elliptical motion of sufficient magnitude to move a driven element in a first direction when the selected contacting portion and driven element are resiliently urged into contact.

5. The apparatus of Claim 4, where the driver circuit and switching element are located more than four times further away from the piezoelectric element than the coil.

6. The apparatus of Claim 4, wherein the same electrical conductor used to form the coil also connects the piezoelectric element to the driver circuit.

7. (Once Amended) A driver apparatus in combination with a vibrating element having a piezoelectric element vibrating a **[the]** mechanical resonator with a selected contacting portion located to engage and move a driven element in a first direction during use of the vibrating apparatus, the piezoelectric element having an inherent capacitance, the combination comprising:

at least one control element;

a piezoelectric resonator driver circuit having a plurality of unidirectional electrical gates to drive the piezoelectric element, the driver circuit being electrically coupled to and controlled by the control element; the piezoelectric element being electrically coupled to and paired with one of the unidirectional gates; and

at least one electromagnetic storage element electrically coupled to the piezoelectric element, wherein the electromagnetic storage element forms an electric resonator together with the capacitance of the vibrating element; and

wherein the unidirectional electrical gates comprise a diode arranged to prevent a negative electrical voltage to the piezoelectric element, and wherein the driver apparatus resonates at a modulated predetermined first resonant frequency selected to cause the vibrating element to cause the selected contacting portion to move in the first elliptical motion with sufficient amplitude to move the driven element in the first direction when the selected contacting portion engages the driven element, and wherein the driver apparatus resonates at a modulated predetermined second resonant frequency selected to cause the vibrating element to cause the selected contacting portion to move in a second elliptical motion with sufficient amplitude to move a driven element in a second direction when the selected contacting portion engages the driven element.

8. The combination of Claim 7, wherein the electromagnetic storage element comprises an electromagnetic inductor coil.

Please delete Claims 9-11.

12. (Once Amended) The combination of Claim **[10]** 7, wherein the inductor encircles a portion of the resonator.

13. (Once Amended) The apparatus of Claim **[10]** 7, further comprising a resistor electrically coupled with the inductor and piezoelectric element and gate element to maintain an input voltage to the piezoelectric element within predetermined operating parameters.

Please delete Claims 14, 15.

16. (Once Amended) A method for controlling the operation of a vibrating element having a piezoelectric element driving a mechanical resonator, the piezoelectric element being driven by an electrical signal, comprising:

placing a control element in electrical communication with the piezoelectric element and an inductor to alternate the electric signal between the inductor and piezoelectric element, the piezoelectric element providing a capacitance to function as a switched resonance L-C circuit so the electrical signal can resonantly drive the vibrating element at a first frequency; **[and]**

selecting the first frequency and configuring the vibrating element to cause a selected contacting portion of the vibrating element to move in a first elliptical path with sufficient amplitude to move a driven element in a first direction when the selected contacting portion engages the driven element;

wherein the inductor and piezoelectric element provide a capacitance to function as a switched resonance L-C circuit so that a second electrical signal can drive the vibrating element at a second mechanical resonance frequency, the second frequency selected in conjunction with the configuration of the vibratory element and its mounting to cause the selected contacting portion of the vibrating element to move in a second elliptical path with sufficient amplitude to move the driven element in a second direction when the selected contacting portion engages the driven element.

17. The method of Claim 16, wherein the voltage to drive the piezoelectric element at the first frequency is greater than the supply voltage to the circuit.

18. The method of Claim 16, further comprising placing a resistor in electrical communication with the piezoelectric element to shape the electrical signal provided to the piezoelectric element.

19. The method of Claim 16, comprising forming at least a portion of the inductor around a portion of the vibratory element.

Please delete Claim 20.

Please add the following new claims:

21. (New) A driver apparatus in combination with a vibrating element having a piezoelectric element vibrating a mechanical resonator with a selected contacting portion located to engage and move a driven element in a first direction during use of the vibrating apparatus, the piezoelectric element having an inherent capacitance, the combination comprising:

at least one control element;

a piezoelectric resonator driver circuit having a plurality of unidirectional electrical gates to drive the piezoelectric element, the driver circuit being electrically coupled to and controlled by the control element; the piezoelectric element being electrically coupled to and paired with one of the unidirectional gates;

at least one electromagnetic storage element electrically coupled to the piezoelectric element, wherein the electromagnetic storage element forms an electric resonator together with the capacitance of the vibrating element; and

wherein the driver apparatus resonates at a predetermined first resonant frequency selected to cause the vibrating element to cause the selected contacting portion to move in the first motion with sufficient amplitude to move the driven element in the first direction when the selected contacting portion engages the driven element, and wherein the driver apparatus resonates at a predetermined second resonant frequency selected to cause the vibrating element to cause the selected contacting portion to move in a second motion with sufficient amplitude to move a driven element in a second direction when the selected contacting portion engages the driven element.

22. (New) A piezoelectric driver apparatus for controlling the operation of a vibrating element having a mechanical resonator, apparatus comprising:

a piezoelectric element having an inherent capacitance and driving the mechanical resonator;

at least one switching element allowing the application of a predetermined signal;

at least one electrical resonator driver circuit driving the vibrating element, wherein the driver circuit is electrically coupled to and activated by the switching element;

at least one inductive coil electrically coupled to the vibrating element to form an electric resonator together with the capacitance of the vibrating element so the signal excites the driver circuit at a predetermined frequency, and wherein the same electrical conductor used to form the coil also bridges a space between the vibrating element and the driver circuit.

23 (New) The apparatus of Claim 22, wherein the mechanical resonator has the shape of an elongated member having a longitudinal axis and a second axis perpendicular thereto, the resonator having an opening defined by sidewalls and containing the piezoelectric element therein, and wherein every cross-section of the resonator perpendicular to the second axis is the same.

24 (New) The apparatus of Claim 22, wherein the mechanical resonator has the shape of an elongated member having a longitudinal axis and a second axis perpendicular thereto, the resonator having an opening defined by sidewalls and containing the piezoelectric element therein, and wherein every cross-section of the resonator perpendicular to the second axis is the same between, but not including, the piezoelectric element and the selected contacting portion.

25. (New) A method for controlling the operation of a vibrating element having a piezoelectric element driving a mechanical resonator, the piezoelectric element being driven by an electric signal, comprising:

placing a control element in electrical communication with the piezoelectric element and an inductor to alternate the electric signal between the inductor and piezoelectric element, the piezoelectric element providing a capacitance to function as a switched resonance L-C circuit so the electrical signal can drive the vibrating element at a first frequency;

forming the inductor from an electric conductor that also connects the vibrating element and the circuit; and

selecting the first frequency and configuring the vibrating element to cause a selected contacting portion of the vibrating element to move in a first path with sufficient amplitude to

move a driven element in a first direction when the selected contacting portion engages the driven element during use;

wherein the inductor and piezoelectric element provide a capacitance to function as a switched resonance L-C circuit so that a second electrical signal can drive the vibrating element at a second frequency, the second frequency selected in conjunction with the configuration of the vibratory element and its mounting to cause the selected contacting portion of the vibrating element to move in a second path with sufficient amplitude to move the driven element in a second direction when the selected contacting portion engages the driven element during use.

26. (New) The method of Claim 25, wherein the second direction is opposite to the first direction.

27. (New) A method for controlling the operation of a vibrating element having a piezoelectric element driving a mechanical resonator, the piezoelectric element being driven by a single electric signal that can be communicated through a first wire to the piezoelectric element, comprising:

placing a control element in electrical communication with the piezoelectric element and an inductor to alternate the electric signal between the inductor and piezoelectric element, the piezoelectric element providing a capacitance to function as a switched resonance L-C circuit so the electrical signal can resonantly drive the vibrating element at a first mechanical resonance frequency; and

selecting the first frequency and configuring the vibrating element to cause a selected contacting portion of the vibrating element to move in a first path with sufficient amplitude to move a driven element in a first direction when the selected contacting portion engages the driven element during use;

wherein the inductor and piezoelectric element provide a capacitance to function as a switched resonance L-C circuit so that a second electrical signal through the first wire can drive the vibrating element at a second mechanical resonance frequency, the second frequency selected in conjunction with the configuration of the vibratory element and its mounting to cause the selected contacting portion of the vibrating element to move in a second path with sufficient

amplitude to move the driven element in a second direction when the selected contacting portion engages the driven element during use.

28. (New) The method of Claim 27, wherein the first path is opposite in direction to the second path.

29. (New) The method of Claim 27, further comprising forming the inductor from an electric conductor that also bridges a space between the vibrating element and the control element.

30. (New, 2-D shape) The method of Claim 27, further comprising forming the mechanical resonator in the shape of an elongated member having a longitudinal axis and a second axis perpendicular thereto, the resonator being formed with sidewalls defining an opening and containing the piezoelectric element therein, with every cross-section of the resonator perpendicular to the second axis being the same.

31. (New) The method apparatus of Claim 27, further comprising forming the mechanical resonator in the shape of an elongated member having a longitudinal axis and a second axis perpendicular thereto, the resonator being formed with sidewalls defining an opening and containing the piezoelectric element therein, and wherein every cross-section of the resonator perpendicular to the second axis is the same from and including the sidewalls, to but not including, the selected contacting portion.

32. (New) The method of Claim 31, wherein the first path is opposite in direction to the second path.

33. (New) The method of Claim 27, further comprising forming the piezoelectric element by cofiring.

34. (New) The method of Claim 16, wherein the piezoelectric element comprises a cofired, multilayer piezoelectric element.

35. (New) The apparatus of Claim 21, wherein the piezoelectric element comprises a cofired, multilayer piezoelectric element.

36. (New) A piezoelectric driver apparatus for controlling the operation of a vibrating element having a mechanical resonator, apparatus comprising:

only one piezoelectric element having an inherent capacitance and driving the mechanical resonator;

at least one switching element allowing the application of a predetermined signal;

at least one electrical resonator driver circuit driving the vibrating element, wherein the driver circuit is electrically coupled to and activated by the switching element to drive the vibrating element at a first frequency selected in conjunction with the configuration of the vibratory element and its mounting to cause a selected contacting portion of the vibrating element to move in a first path with sufficient amplitude to move a driven element in a first direction when the selected contacting portion engages the driven element during use, the driver circuit providing a single first signal to the vibrating element; and

the driver circuit providing a second signal to the vibrating element to drive the vibrating element at a second frequency selected in conjunction with the configuration of the vibratory element and its mounting to cause the selected contacting portion of the vibrating element to move in a second path with sufficient amplitude to move the driven element in a second direction when the second selected contacting portion engages the driven element during use;

wherein the first and second electrical signals are communicated through the same electrical conductor to the piezoelectric element.

37. (New) The apparatus of Claim 36, wherein the first path is opposite in direction to the second path.

38. (New) The apparatus of Claim 36, further comprising at least one inductive coil electrically coupled to the vibrating element to form an electric resonator together with the capacitance of the piezoelectric, wherein the same electrical conductor used to form the coil also bridges a space between the vibrating element and one of the switching element and the driving circuit.

39. (New) The apparatus of Claim 36, wherein the mechanical resonator is formed in the shape of an elongated member having a longitudinal axis and a second axis perpendicular thereto, and further formed to have an opening defined by sidewalls and containing the

piezoelectric element therein, and wherein every cross-section of the resonator perpendicular to the second axis is the same.

40. (New) The apparatus of Claim 36, wherein the mechanical resonator is formed in the shape of an elongated member having a longitudinal axis and a second axis perpendicular thereto, and further formed to have an opening defined by sidewalls and containing the piezoelectric element therein, and wherein every cross-section of the resonator perpendicular to the second axis is the same from and including the sidewalls to but not including the selected contacting portion.

41. (New) The apparatus of Claim 36, wherein the piezoelectric element comprises a cofired, multilayer piezoelectric element.